

NIOSH

ALERT

**Preventing Worker Injuries
and Deaths From Moving
Refuse Collection Vehicles**



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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DHHS (NIOSH) Publication No. 97-110

May 1997

Preventing Worker Injuries and Deaths From Moving Refuse Collection Vehicles

WARNING!

Workers risk injury and death when riding on or working near refuse collection vehicles.

Take the following steps to protect yourself from injury when riding on or working near refuse collection vehicles:

1. Observe safe backing procedures.

Drivers should do the following:

- Stop backing immediately if visual contact is lost with workers on foot.
- Resume backing only when visual contact is restored with workers on foot.
- Use a coworker as a spotter.
- Use agreed-upon hand signals to communicate with the spotter.

Other crew members should do the following:

- Step off the riding steps before the driver begins to back.
- Remain inside the vehicle cab unless needed to act as a spotter.
- Never cross or step behind the vehicle when it is backing or when its backup lights are on.

Spotters should do the following:

- Remain visible in the driver's mirrors.
- Maintain a clear view of the hazard area (driver's blind spot) behind the vehicle.
- Stay clear of the vehicle's path.
- Avoid walking backward.

- Use agreed-upon hand signals to communicate with the driver.
- Be sure that no one is on the riding steps or behind the vehicle before signaling the driver to start backing.
- Immediately signal the driver to stop if any person or object enters the area behind the truck.
- Signal the driver to stop if the spotter must change positions when the vehicle is backing.

2. Observe safe riding procedures.

Refuse collectors should do the following:

- Ride in the cab or a separate vehicle when not on the collection route.
- Use riding steps only when the vehicle is moving forward for short distances (0.2 mile or less) at slow speeds (10 miles per hour or less).
- After the vehicle has stopped, step—do not jump—on or off riding steps.
- Wear slip-resistant footwear and avoid narrow cleats or spikes.
- Be extremely observant of the driver's blind spot behind the vehicle.

Drivers should do the following:

- Wait for step riders to signal before putting the vehicle in motion.
- Avoid sudden stops that could cause riders to be thrown from the steps.

For additional information, see ***NIOSH Alert: Preventing Worker Injuries and Deaths From Moving Refuse Collection Vehicles*** [DHHS (NIOSH) Publication 97-110]. Single copies of the Alert are available free from the following:

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**U.S. Department of Health and Human Services
Public Health Service
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Preventing Worker Injuries and Deaths From Moving Refuse Collection Vehicles

WARNING!

Workers risk injury and death when riding on or working near refuse collection vehicles.

The National Institute for Occupational Safety and Health (NIOSH) requests assistance in preventing worker injuries and deaths associated with moving refuse collection vehicles. Data from the NIOSH National Traumatic Occupational Fatalities (NTOF) Surveillance System indicate that many fatalities occur when workers fall from or are struck by refuse collection vehicles. Recent NIOSH investigations conducted under the Fatality Assessment and Control Evaluation (FACE) Program suggest that employers and workers may not be fully aware of or may be complacent about the hazards of riding on and working near moving refuse collection vehicles. This Alert describes six fatal incidents involving these vehicles and offers recommendations for preventing such incidents.

NIOSH requests that editors of trade journals, safety and health officials, municipal sanitation administrators, private refuse collection companies,

private and municipal landfill operators, and manufacturers of refuse collection equipment bring this Alert to the attention of all employers, managers, supervisors, and workers in the solid waste industry.

BACKGROUND

The NTOF surveillance system indicates that between 1980 and 1992, 450 workers aged 16 or older died in incidents related to refuse collection; 303 (67%) of these incidents were vehicle-related [NIOSH 1995]. Of the vehicle-related deaths, 110 (36%) occurred when the worker slipped or fell from a refuse collection vehicle, was struck or run over by the vehicle, or fell and was struck or run over by the refuse collection vehicle. Twenty (18%) of the 110 fatalities occurred when the refuse collection truck was backing up.

REGULATIONS AND STANDARDS

Current OSHA regulations do not specifically address refuse collection vehicles. However, the American National Standards Institute (ANSI) has published *Safety Standards for Mobile Refuse Collection and Compaction Equipment*, which addresses safe operation and construction of the equipment and includes recommendations for rider and pedestrian safety [ANSI 1992]. These standards recommend that workers

- ride only in the vehicle cab or on steps specifically designed for riding,
- remain inside the vehicle cab until the vehicle is completely stopped,
- ensure that no riders are using the riding steps when the vehicle is backing, exceeding 10 miles per hour, or traveling more than 0.2 mile, and
- ensure that no one rides on the loading sills or in hoppers.

The ANSI standards also address the design and construction of the vehicle in relation to rider and pedestrian safety by recommending the following:

- Riding steps should provide a self-cleaning, slip-resistant surface that is at least 220 square inches and capable of supporting 500 pounds. The steps should be at least 8 inches deep, mounted behind the rearmost axle of the vehicle, and not more than 24 inches above the road surface.

- Grab handles capable of withstanding a 500-pound pull should be provided along with the riding steps.
- Warning signs should be posted above the riding steps to prohibit their use when traveling at speeds above 10 miles per hour or when backing.
- The vehicle should be equipped with an audible warning device that activates when the vehicle is operated in reverse.

The National Solid Waste Management Association (NSWMA) has developed comprehensive safety practices for workers engaged in solid waste collection. The *NSWMA Manual of Recommended Safety Practices* contains detailed procedures for backing safely, acting as a spotter during backing, and working around mobile equipment [NSWMA 1988]. These procedures include the following:

- Maintaining visual contact between the driver and workers on foot when working close to the vehicle and when backing
- Checking both side mirrors repeatedly when backing
- Using a reliable spotter positioned to see both the driver and any blind spots behind the vehicle when backing
- Using standard hand signals when backing
- Stopping the truck if the spotter must change positions
- Immediately stopping the maneuver if visual contact with the spotter is lost

- Remaining clear of the rear of the vehicle when the back-up lights are on or the alarm is sounding

CASE REPORTS

Between November 1990 and June 1995, the NIOSH FACE Program and the NIOSH-funded State FACE Program investigated 10 workplace fatalities related to refuse collection vehicles. The following case reports summarize six of these incidents.

Case No. 1

On June 5, 1995, a 43-year-old sanitation worker died after he was run over by the rear wheels of a side-loading refuse collection truck. The victim and his employer were collecting refuse on a rural collection route and had made several stops along the route. When the employer stopped the vehicle for a pickup, the victim exited from the right side of the truck cab and picked up refuse located on the right side of the highway. The victim then started to cross the highway and walk to the next pickup. The employer checked his mirrors and saw the victim start across the highway. He then pulled out onto the highway and proceeded to the next stop. As he did so, the victim tried to board the left-side loading step of the moving vehicle. The victim fell into the path of the left rear wheel and was run over. Emergency assistance was requested, and the victim was transported by air to a trauma center 40 miles away, where he died of massive abdominal trauma [Missouri Department of Health 1996].

Case No. 2

On March 17, 1994, a 59-year-old male refuse collector was crushed by a refuse collection truck while at a landfill. The victim and two coworkers (a driver and another refuse collector) had completed a

collection route and were at the landfill to dump the refuse. The victim exited from the cab of the truck on the passenger side. After signaling the driver to begin backing, he began to walk along the side of the truck toward the rear. As the victim walked behind the truck, he stumbled and fell into the path of the truck. The truck rolled over the right side of his body before the driver stopped backing. The coworkers were unaware that the victim had been run over until a witness told them what had happened. Paramedics treated the victim at the scene before transporting him to the hospital, where he died 80 minutes later [Maryland Division of Labor and Industry 1994].

Case No. 3

On February 14, 1994, a 41-year-old male municipal sanitation worker died from head injuries he received when he was run over by the refuse collection truck on which he had been riding. The victim and a coworker (driver) had been assigned curbside pickups in a residential section of the city. They had just completed a pickup and the victim had mounted the right- (curb-) side loading step of the side-loading collection truck. The coworker boarded the right-side driver's station and was driving the vehicle to the next pickup about 40 feet away when the victim slipped off the loading step and landed on the pavement in the path of the right rear wheel. The incident was witnessed by a homeowner who called out to the driver to stop. The driver immediately stopped, but the vehicle had already run over the victim's head. The victim was pronounced dead at the scene [NIOSH 1994].

Case No. 4

On July 15, 1992, a 52-year-old male refuse collector was crushed to death

when a refuse collection vehicle ran over him at the town landfill. The victim and two coworkers (a driver and another refuse collector) made up the three-person crew. The two coworkers rode inside the cab, and the victim rode on the rear riding step. They finished the last collection run of the day and the driver parked the truck beside the access road to the landfill. The refuse collector inside the cab exited from the truck to find that the victim (who had been on the rear riding step) had been run over and was lying face down on the ground in front of the truck. It is not known whether the victim fell from the riding step or had dismounted before he was run over by the truck [NIOSH 1992].

Case No. 5

On November 9, 1990, a 44-year-old male county refuse collector died after falling from the rear riding step of a moving refuse truck. The victim, another refuse collector, and the driver of the truck were following a routine collection route, picking up bags of leaves. After picking up several bags at a business, the workers were traveling to another pickup site about a half mile away. The victim was feeling ill and decided to ride on the rear of the truck to get some fresh air. The driver and coworker rode inside the cab of the truck. While the truck was traveling along a rural highway at about 35 miles per hour, the victim lost his balance and fell 12 inches to the pavement from the rear riding step. The victim died of head injuries sustained in the fall [NIOSH 1991].

Case No. 6

On November 7, 1990, a 33-year-old male refuse collector and two coworkers (truck driver and refuse collector) were collecting refuse along a routine route. The victim rode as usual on the riding step at the rear

of the truck. The driver entered a residential alley, and the victim signaled him from the rear of the truck to begin backing. The driver backed the truck while watching the victim in the left side mirror. As he continued to back, he checked the right side mirror; but when he glanced back to the left mirror, he could not locate the victim. He felt a slight bump, stopped, pulled the truck forward, and left the truck cab to investigate. He found the victim face down behind the vehicle with his head directly behind the left rear wheels of the truck [Colorado Department of Health 1990].

CONCLUSIONS

The fatal incidents reported here suggest that employers and workers may not be fully aware of or may be complacent about the hazards of riding on and working near moving refuse collection vehicles.

RECOMMENDATIONS

NIOSH recommends that employers (1) develop and implement safe work procedures for riding on and working near moving refuse collection vehicles, and (2) train workers in these procedures. In addition, NIOSH recommends that employers and manufacturers of refuse collection vehicles carefully evaluate the design, selection, and equipment of these vehicles.

Workers should be trained to adopt the procedures described in the following subsections.

Hazardous Area

Drivers and collectors should be trained to recognize the hazardous area around a refuse collection vehicle. The size of this

hazardous area depends on the boundaries of the driver's blind spot and the distance needed to stop the vehicle gradually, without throwing a step rider from the steps.

Safe Riding Procedures

Riding Position

- Collectors should ride in the vehicle cab when traveling to or between collection routes. When adequate seating is not available inside the cab, collectors should be transported to and from the collection route by a separate vehicle.
- Riding steps should be used only when moving forward for short distances (0.2 mile or less) at slow speeds (10 miles per hour or less).
- When the riding steps are in use, drivers and crew members should be alert for obstructions such as poles and tree limbs, parked vehicles, and tight clearances that could injure step riders.
- Collectors should not ride the steps when the vehicle is backing.

Boarding and Dismounting from the Riding Steps

- Collectors should step—not jump—on or off riding steps.
- Collectors should board or dismount from these steps only when the vehicle is completely stopped and the driver is aware of the collector's location.
- Drivers should wait for the collector to signal before moving. The collector can signal the driver by hand or with a buzzer mounted for easy activation by step riders.

- Signals should be uniform throughout the department or firm to avoid confusion [NIOSH 1982].

Sudden Stops

Drivers should avoid sudden stops that could cause step riders to be thrown from the vehicle.

Safe Backing Procedures

Workers should be trained to follow NSWMA practices [NSWMA 1988]:

- Before backing, drivers should
 - turn on the vehicle's hazard lights,
 - roll down the window,
 - turn off all but two-way radios,
 - make sure that no one is on the riding steps, and
 - visually locate workers on foot to make sure that they are clear of the vehicle's path.
- When backing, drivers should
 - stop backing immediately if visual contact is lost with workers on foot,
 - resume backing only after visual contact is restored with workers on foot,
 - use a coworker as a spotter, and
 - use agreed-upon hand signals to communicate with the spotter.
- Other crew members should
 - step off the riding steps before the driver begins to back,
 - remain inside the vehicle cab unless needed to act as a spotter, and
 - never cross or step behind the vehicle when it is backing or when its backup lights are on.
- Spotters should
 - remain visible in the driver's mirrors,

- maintain a clear view of the hazard area (driver's blind spot) behind the vehicle,
- stay clear of the vehicle's path,
- avoid walking backward,
- use agreed-upon hand signals to communicate with the driver,
- be sure that no one is on the riding steps or behind the vehicle before signaling the driver to start backing,
- immediately signal the driver to stop if any person or object enters the area behind the truck, and
- signal the driver to stop if the spotter must change positions when the vehicle is backing; the spotter should then move to the new position and signal the driver to continue.

Safety Equipment

Clothing

Refuse collectors should wear highly visible colors to help vehicle operators visually locate the collectors' positions during backing. If collectors are required to work during nondaylight hours, they should be issued and required to wear light-reflective clothing.

Footwear

Refuse collectors should wear slip-resistant footwear to protect against slips and falls from riding steps. Shoes with cleated, self-cleaning soles are appropriate for muddy conditions often found at landfills. However, collectors should avoid shoes with very narrow cleats or spikes that might get caught in open mesh riding steps or make walking on pavement difficult.

Audible Alarms

To warn workers and pedestrians of backing, refuse collection vehicles should be equipped with audible alarms that can be distinguished from the surrounding noise

level. ANSI [1992] requires such alarms to have a minimum output of 87 decibels. Because the effectiveness of a back-up alarm depends on the worker's ability to hear it and remove himself from the danger zone, these alarms should be designed and installed so that they are activated before the vehicle moves, when the transmission is shifted to reverse.

Riding Facilities

Refuse collection vehicles should be equipped with enough seating space inside the cab for all members of a collection crew. If refuse collectors are permitted to ride the riding steps while on the collection route, the steps should be as follows:

- Constructed of perforated floor materials to prevent accumulation of debris
- Constructed of slip-resistant materials and large enough to accommodate the worker comfortably
- Located so that workers can easily board and dismount from them
- Located behind the rearmost axle of the vehicle

In addition, slip-resistant hand-holds should be readily accessible.

Existing Technology

Though technology is not a substitute for safe work practices, it can improve the safety of workers near moving vehicles. Employers, equipment manufacturers, and suppliers of refuse collection equipment should evaluate the applicability of the following equipment and devices for improving worker safety.

Personal Warning Devices

Small compressed-gas horns worn on the belt can be sounded if the worker trips or falls in the path of backing vehicles.

Radio Communications

Refuse collectors can use two-way radios to communicate with vehicle drivers. Radio communication should not replace visual contact between drivers and spotters, but it can improve safety by maintaining communication if visual contact is momentarily lost.

Rear-View Mirrors

Additional convex mirrors can be mounted at the rear corners of some vehicles to provide vision across the back. These devices supplement the rear-view mirrors traditionally mounted on each side of the vehicle at the cab windows.

Closed-Circuit Television

Closed-circuit television systems are currently used on some vehicles to monitor the blind spot behind the vehicle.

Sensor Technology

Infrared or ultrasonic sensing units can detect persons or other objects in the path of a backing vehicle and activate an alarm

inside the cab. These devices are being used successfully on school buses to alert drivers to children who enter the blind spots in front of the buses; the devices have already been installed on refuse collection vehicles in some areas [Hubbard 1996]. Although sensor technology is not applicable to all vehicle designs, it is improving and should be considered when buying new equipment.

Guarding of Equipment

Refuse collection vehicles should be equipped with strategically placed guards or extended bodywork to prevent workers from falling into the path of the wheels. These guards might not prevent the actual fall, but they could significantly reduce the injury by deflecting the victim from the path of the wheels. Figure 1 shows a typical side-loading refuse collection vehicle with an open area between the loading step and the rear wheels (loading steps are *not* intended or recommended for riding). Figure 2 shows the same vehicle with

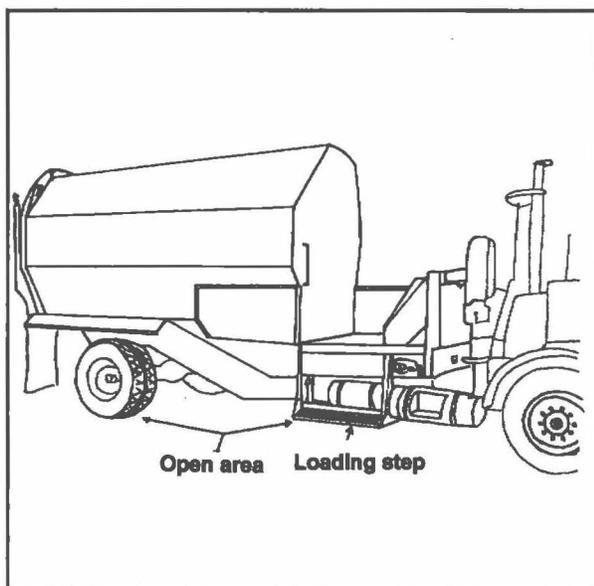


Figure 1. Typical side-loading refuse collection vehicle with an open area between the loading step and the rear wheels.

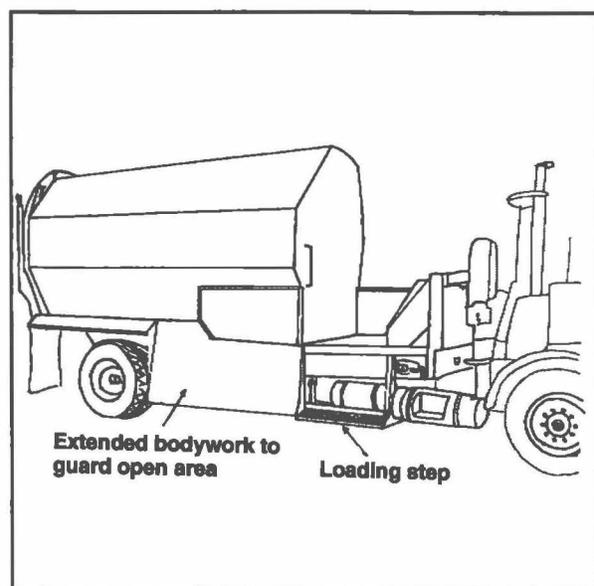


Figure 2. Typical side-loading refuse collection vehicle with extended bodywork to guard the open area between the loading step and the rear wheels.

extended bodywork to guard the open area between the step and rear wheel.

This concept may have limited application if the vehicle is required to travel over uneven terrain. However, this type of bodywork could be put in place at the time of manufacture or retrofitted to vehicles operating over fairly even terrain.

ACKNOWLEDGMENTS

The principal contributor to this Alert was Paul H. Moore, Division of Safety Research. NIOSH also acknowledges the Colorado Department of Health, the Maryland Division of Labor and Industry, and the Missouri Department of Health for contributing case studies reported in this Alert.

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We greatly appreciate your assistance in protecting the health of U.S. workers.



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